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## DICOM Conformance Statement EchoInsight

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*EchoInsight versions 2.2.2 and higher*

Ultrasound Medical Devices Inc./dba Epsilon Imaging, Inc.  
3917 Research Park Drive, Suite B7  
Ann Arbor, MI 48108  
734.369.5100  
[www.epsilon-imaging.com](http://www.epsilon-imaging.com)

## Conformance Statement Overview

DICOM features included in EchoInsight provide capabilities for querying other DICOM nodes for ultrasound studies, requesting and retrieving DICOM image files from other DICOM nodes, and receiving DICOM image files pushed from other DICOM nodes. EchoInsight can read DICOM image files from DICOM compliant storage media. EchoInsight can also generate and send reports as DICOM encapsulated PDFs and Structured Reports to other DICOM nodes.

The table below provides an overview of network services supported by EchoInsight.

### NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
<b>Transfer (Note 1)</b>		
Ultrasound Multiframe Image Storage	Yes	No
Ultrasound Multiframe Image (Ret) Storage	Yes	No
Ultrasound Image Storage	Yes	No
Ultrasound Image (Ret) Storage	Yes	No
Ultrasound Enhanced Volume Storage	Yes	No
Encapsulated PDF Storage	No	Yes
Structured Reporting - Basic Text	No	Yes (Note 2)

Note 1: See sections 2.3.1 and 2.3.2 for UID values corresponding to the listed Transfer classes.

Note 2: Structured Report output will be available in 2.3.0 and higher versions.

Although EchoInsight will receive and acknowledge the US single image SOP class data transfers, it currently does not store these images. EchoInsight also does not support any Workflow Management or Print Management SOP classes.

EchoInsight can ingest DICOM data on media of various physical formats (CD, DVD, USB removable devices). The table below summarizes this capability.

### MEDIA SERVICES

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
CD and DVD optical media	No	Yes
USB connected removable devices	No	Yes

EchoInsight supports Verification (SCP), as required for all acceptors of DICOM associations.

## Revision History:

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# 1. Introduction

## 1.1. Purpose

This document provides the DICOM Conformance Statement for EchoInsight, an ultrasound imagery analysis software package developed by Ultrasound Medical Devices, dba Epsilon Imaging. EchoInsight running on a personal computer or laptop provides capabilities for viewing multi-image study clips, selecting and labeling a subset of study clips for analysis, processing these subsets of clips for analysis utilizing a speckle tracking method, analyzing the processed clips to obtain measures of tissue structure and motion, and generating reports containing the analysis results.

Section 2 of this document details the supported network interactions between EchoInsight and other imaging and image storage devices that conform to the DICOM 3.0 standard.

Section 3 details the support EchoInsight provides for DICOM exchange media. EchoInsight only reads ultrasound imagery from DICOM exchange media; it does not write or update DICOM File Sets residing on DICOM exchange media.

## 1.2. References and Definitions

Digital Imaging and Communications in Medicine (DICOM) Standard v3.0, parts 1 through 17 (NEMA PS 3.1 – 3.17).

## 1.3. Acronyms and Abbreviations

Symbols and abbreviations used in this conformance statement are defined in Digital Imaging and Communications in Medicine (DICOM) standard v3.0, parts 1 through 17 (NEMA PS 3.1 – 3.17).

## 2. Network Conformance Statement

### 2.1. Introduction

This section describes network interactions of the EchoInsight software.

### 2.2. Implementation Model

EchoInsight functions as both a Query/Retrieve SCU and as an encapsulated PDF and Structured Report SCP.

#### 2.2.1. Application Data Flow Diagram

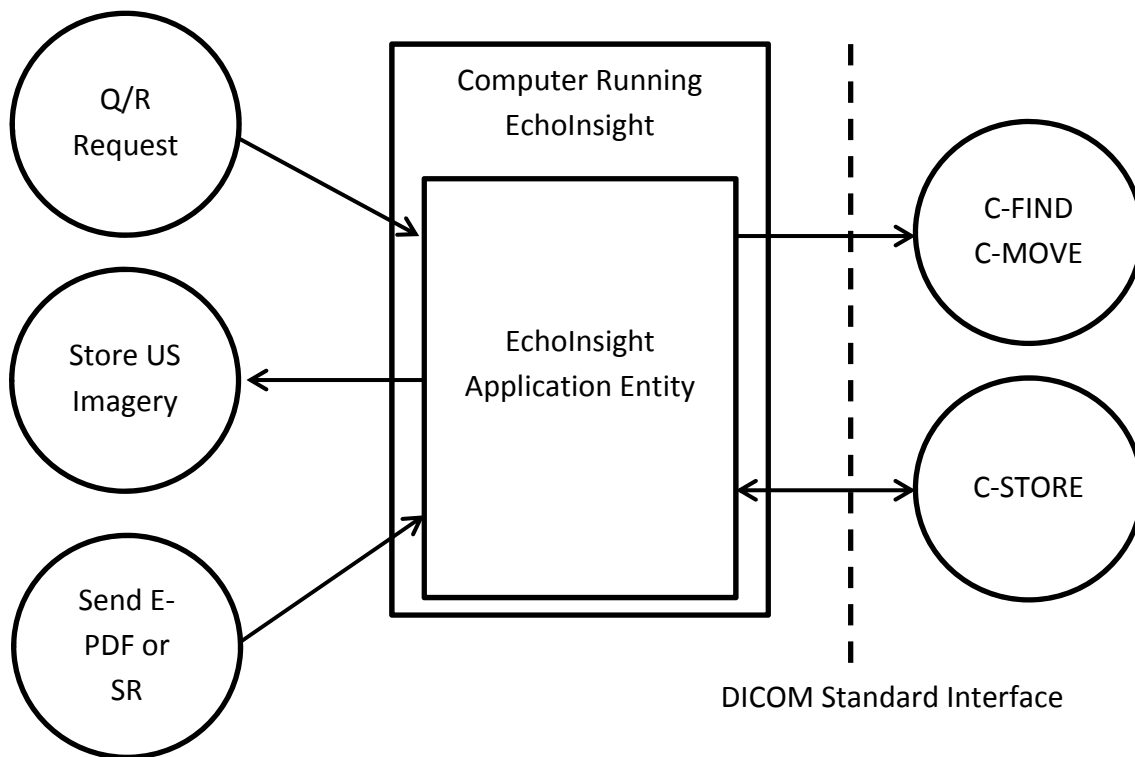


Figure 2.2-1. EchoInsight Implementation Model

## 2.2.2. Functional Definition of Application Entity

All communication with remote DICOM applications is accomplished using the DICOM protocol over a network using the TCP/IP protocol stack. EchoInsight supports the following functions.

SCU	SCP
	Echo (Verification)
Query/Retrieve	
Storage	Storage

## 2.2.3. Sequencing of Real World Activities

EchoInsight will be used as follows:

- Query networked DICOM server(s) for a study.
- Retrieve study from networked DICOM server.
- (Internal) Perform analysis workflow on several multi-frame imagery clips from study.
- Store encapsulated PDF and/or Structured Report back to network DICOM server as new series in study.

## 2.3. Application Entity Specifications

### 2.3.1. EchoInsight acting as a Query/Retrieve SCU

EchoInsight provides standard conformance to the following DICOM SOP Classes as an SCU.

Function	SOP Class UID	SOP Class Name
Query/Retrieve	1.2.840.10008.5.1.4.1.2.2.1	Study Root Query/Retrieve Model – FIND
Query/Retrieve	1.2.840.10008.5.1.4.1.2.2.2	Study Root Query/Retrieve Model – MOVE

EchoInsight utilizes the Study SOP classes above in its default configuration. EchoInsight can be configured for Patient Root Query/Retrieve in place of Study Root.

#### 2.3.1.1. Association Establishment Policies

EchoInsight initiates associations with configured DICOM query nodes. It does not accept query/retrieve associations.

##### 2.3.1.1.1. General

The DICOM Application Context Name that is proposed by EchoInsight is 1.2.840.10008.3.1.1.1. The services offer a PDU size of 128K bytes by default upon association initiation. There is no limit on the number of Presentation Context Items that will be proposed.



### **2.3.1.1.2. Number of Associations**

EchoInsight normally opens one association at a time as a Query/Retrieve SCU. The user may invoke multiple Q/R user interface windows and thereby initiate multiple simultaneous Q/R associations.

### **2.3.1.1.3. Asynchronous Nature**

EchoInsight does not support asynchronous query operations.

### **2.3.1.1.4. Implementation Identifying Information**

The implementation Class UID is: “1.3.6.1.4.1.11157.I.J.K ”

The Implementation Version String is: “msiCOM3 I.J.X”

In both instances, the I, J, and K (last three numbers) are the major, minor and revision numbers of the Multitech msiCOM3 DIOCM Toolkit used by Epsilon to construct EchoInsight.

### **2.3.1.2. Association Initiation by Real-World Activity**

EchoInsight acting in its Query/Retrieve role initiates associations for the following activities:

- Querying a remote DICOM node for available studies.
- Retrieval of studies from a remote DIOCM node.
- Testing that it can establish an association with a remote DICOM node for Query/Retrieve.

#### **2.3.1.2.1. Real-World Activity – DICOM Query**

##### **2.3.1.2.1.1. Associated Real World Activity – DICOM Query**

The user selects one or more configured query nodes and then sets the selection criteria to use in the query request. The user interface displays the results of the query by showing a one line description of each study that matches the criteria.

EchoInsight also has an optionally configurable automatic query/retrieve mode. If this service is enabled, EchoInsight periodically issues queries filtered by only the current date, thus obtaining the list of studies available for the current date. Each query result is compared with the last query result to identify changes (i.e. new studies available in the remote DICOM node).

### 2.3.1.2.1.2. Proposed Presentation Contexts – DICOM Query

EchoInsight proposes the Presentation Contexts shown below.

Abstract Syntax Name	Abstract Syntax UID	Transfer Syntax Name	Transfer Syntax UID	Role	Extended Negotiation
Study Root Query Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR, LE;	1.2.840.1008.1.2	SCU	None
		Explicit VR, LE;	1.2.840.1008.1.2.1		
		Explicit VR, BE	1.2.840.1008.1.2.2		
		Explicit VR, LE, Deflated	1.2.840.10008.1.2.1.99		

### 2.3.1.2.1.3. SOP Specific Conformance to Study Root Query SOP Class

EchoInsight uses a Study Root C-FIND as defined in DICOM Part 4 to query for images. All Required (R) and Unique (U) and some Optional (O) Study and Series level keys are used as shown in the following table.

Data Level	Description	Tag	Type
Study	Patient Name	(0010,0010)	R
Study	Patient ID	(0010,0020)	R
Study	Study ID	(0020,0010)	R
Study	Study Instance UID	(0020,000D)	U
Study	Accession Number	(0008,0050)	R
Study	Study Date	(0008,0020)	R
Series	Series Modality	(0008,0060)	R
Series	Series Number	(0020,0011)	R
Series	Series Instance UID	(0020,000E)	U
Series	Number of Series Related Instances	(0020,1209)	O

### 2.3.1.2.2. Real-World Activity – DICOM Retrieve

#### 2.3.1.2.2.1. Associated Real World Activity – DICOM Retrieve

The user selects one or more studies that were listed from a Query and retrieves the selected studies from the remote DICOM node.

If configured and active, the EchoInsight automatic query/retrieve service will issue a retrieve request for each new study appearing in the last auto query result listing.

### 2.3.1.2.2.2. Proposed Presentation Contexts – DICOM Retrieve

EchoInsight supports the Presentation Contexts shown below.

Abstract Syntax Name	Abstract Syntax UID	Transfer Syntax Name	Transfer Syntax UID	Role	Extended Negotiation
Study Root Query Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR, LE;	1.2.840.1008.1.2	SCU	None
		Explicit VR, LE;	1.2.840.1008.1.2.1		
		Explicit VR, BE	1.2.840.1008.1.2.2		
		Explicit VR, LE, Deflated	1.2.840.10008.1.2.1.99		

### 2.3.1.2.2.3. SOP Specific Conformance to Study Root Retrieve SOP Class

EchoInsight provides standard conformance for Study Root C-MOVE as defined in Part 4 of the DICOM specification.

### 2.3.1.2.3. Real-World Activity – Test Q/R Association

#### 2.3.1.2.3.1. Associated Real World Activity – Test Q/R Association

At startup of the components of EchoInsight that perform Query/Retrieve (either automatically – DicomProcessorService, or upon user command – Q/R Studies window in Study Manager), EchoInsight establishes a Query (FIND) association with each configured connection to a remote DICOM node to test for correct configuration and that the node is responsive.

#### 2.3.1.2.3.2. Proposed Presentation Contexts – Test Q/R Association

EchoInsight supports the same Presentation Contexts as for DICOM Query for this testing purpose. These contexts are shown in in section 2.3.1.2.1.2 and not repeated here.

#### 2.3.1.2.3.3. SOP Specific Conformance for Test Q/R Association

EchoInsight tests that it can successfully establish an association with the remote DICOM node for the purpose of doing a FIND. No query request is actually issued – only the association is established, then dropped.

### 2.3.1.3. Association Acceptance Policies

EchoInsight does not accept any associations when acting in its Query/Retrieve SCU role.

### 2.3.2. EchoInsight acting as a STORE SCP

EchoInsight provides standard conformance to the following DICOM SOP Classes as a Store SCP.

Function	SOP Class UID	SOP Class Name
Storage	1.2.840.10008.5.1.4.1.1.3.1	Ultrasound Multi-Frame Image Storage
Storage	1.2.840.10008.5.1.4.1.1.3	US Multiframe Image (Ret) Storage
Storage	1.2.840.10008.5.1.4.1.1.6.1	US Image Storage
Storage	1.2.840.10008.5.1.4.1.1.6	Image (Ret) Storage
Storage	1.2.840.10008.5.1.4.1.1.6.2	US Enhanced Volume Storage

#### 2.3.2.1. Association Establishment Policies

##### 2.3.2.1.1. General

EchoInsight does not initiate associations when acting as a Store SCP. It accepts associations from any DICOM node for image storage.

##### 2.3.2.1.2. Number of Associations

EchoInsight does not limit the number of associations accepted by its Store SCP function.

#### 2.3.2.2. Association Initiation by Real-World Activity

STORE associations are initiated by remote DICOM nodes. There are several possible scenarios:

- Remote DICOM node is a PACS initiating a response to a manual (user-initiated) Q/R from EchoInsight Study Manager.
- Remote DICOM node is a PACS responding to automatic Q/Rs from the EchoInsight DICOMProcessorService “auto Q/R” feature (when configured and enabled).
- Remote DICOM node is a PACS that has been commanded to copy a study to EchoInsight from within the PACS’ native reader client software.
- Remote DICOM node is an ultrasound scanner that has been configured for EchoInsight associations and the sonographer has initiated a “push” of a newly collected study.

### 2.3.2.2.1. Image Storage

#### 2.3.2.2.1.1. Associated Real World Activity

EchoInsight accepts images from remote DICOM nodes and stores the IODs.

#### 2.3.2.2.1.2. Accepted Presentation Context

SOP Class Name	SOP Class UID	Role	Extended Negotiation	Transfer Syntax
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	SCP	None	(See below)
US Multiframe Image (Ret) Storage	1.2.840.10008.5.1.4.1.1.3	SCP	None	(See below)
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	SCP	None	(See below)
Image (Ret) Storage	1.2.840.10008.5.1.4.1.1.6	SCP	None	(See below)
US Enhanced Volume Storage	1.2.840.10008.5.1.4.1.1.6.2	SCP	None	(See below)

Transfer Syntax	Transfer Syntax UID
JPEG Baseline	1.2.840.10008.1.2.4.50
JPEG-2K Lossy	1.2.840.10008.1.2.4.91
JPEG-LS Lossy	1.2.840.10008.1.2.4.81
JPEG Extended	1.2.840.10008.1.2.4.51
JPEG Extended Arithmetic	1.2.840.10008.1.2.4.52
JPEG Extended Hierarchical	1.2.840.10008.1.2.4.59
JPEG Extended Hierarchical Arith	1.2.840.10008.1.2.4.60
JPEG Full	1.2.840.10008.1.2.4.55
JPEG Full Arithmetic	1.2.840.10008.1.2.4.56
JPEG Full Hierarchical	1.2.840.10008.1.2.4.63
JPEG Full Hierarchical Arith	1.2.840.10008.1.2.4.64
JPEG Spectral	1.2.840.10008.1.2.4.53
JPEG Spectral Arithmetic	1.2.840.10008.1.2.4.54
JPEG Spectral Hierarchical	1.2.840.10008.1.2.4.61
JPEG Spectral Hierarchical Arith	1.2.840.10008.1.2.4.62
JPEG-2K Multi-comp Lossy	1.2.840.10008.1.2.4.93
MPEG2 Main Level	1.2.840.10008.1.2.4.100
MPEG2 High Level	1.2.840.10008.1.2.4.101
MPEG4	1.2.840.10008.1.2.4.102
MPEG4 BD-compatible	1.2.840.10008.1.2.4.103
JPEG-2K Lossless	1.2.840.10008.1.2.4.90
JPEG-2K Multi-comp Lossless	1.2.840.10008.1.2.4.92
JPEG Lossless No Prediction	1.2.840.10008.1.2.4.57
JPEG Lossless No Prediction Arith	1.2.840.10008.1.2.4.58
JPEG Lossless No Prediction Hier	1.2.840.10008.1.2.4.65
JPEG Lossless No Prediction Hier Arith	1.2.840.10008.1.2.4.66
JPEG Lossless First Order Prediction	1.2.840.10008.1.2.4.70
JPEG-LS Lossless	1.2.840.10008.1.2.4.80
JPIP Referenced	1.2.840.10008.1.2.4.94
JPIP Referenced Deflate	1.2.840.10008.1.2.4.95
RLE Lossless	1.2.840.10008.1.2.5
Little Endian Implicit	1.2.840.10008.1.2
Little Endian Explicit	1.2.840.10008.1.2.1
Deflated Little Endian Explicit	1.2.840.10008.1.2.1.99
Big Endian Explicit	1.2.840.10008.1.2.

### 2.3.2.2.1.3. SOP Specific Conformance Storage SOP Classes

Multi-frame images: EchoInsight provides standard conformance for a STORE for multi-frame ultrasound images.

Single-frame images: EchoInsight accepts transfers of ultrasound single-frame images but does not store these images (they are deleted upon recognition in import processing).

EchoInsight can be configured to accept other presentation contexts not listed above, and passing such data to the processing component is also configurable. Configuring EchoInsight to accept associations involving other SOP classes may be required if the remote DICOM node expects such behavior from EchoInsight in order to complete the transfer of all ultrasound data objects in a retrieved study. Additional configured SOP accepted classes may also be required if such classes are used to store ultrasound data that is to be processed by EchoInsight (e.g. Secondary Capture SOPs used to store de-identified ultrasound data).

### 2.3.2.3. Association Acceptance Policies

EchoInsight accepts associations from any DICOM node for storing images.

### 2.3.3. EchoInsight acting as a STORE SCU

EchoInsight provides standard conformance to the following DICOM SOP Classes as a Store SCU.

Function	SOP Class UID	SOP Class Name
Storage	1.2.840.10008.5.1.4.1.1.104.1	Encapsulated PDF Storage
Storage	1.2.840.10008.5.1.4.1.1.88.11	Basic Text Structured Report Storage

### 2.3.3.1. Association Establishment Policies

#### 2.3.3.1.1. General

EchoInsight initiates associations with configured remote DICOM STORE SCP entities. The DICOM Application Context Name that is proposed by EchoInsight is 1.2.840.10008.3.1.1.1. The services offer a PDU size of 128K bytes by default upon association initiation. There is no limit on the number of Presentation Context Items that will be proposed.

#### 2.3.3.1.2. Number of Associations

EchoInsight opens one association at a time from its Store SCU function.

#### 2.3.3.1.3. Asynchronous Nature

EchoInsight does not support asynchronous store operations.

#### 2.3.3.1.4. Implementation Identifying Information

The implementation Class UID is: “1.3.6.1.4.1.11157.I.J.K ”

The Implementation Version String is: “msiCOM3 I.J.X”

In both instances, the I, J, and K (last three numbers) are the major, minor and revision numbers of the Multitech msiCOM3 DIOCM Toolkit used by Epsilon to construct EchoInsight.

### 2.3.3.2. Association Initiation by Real-World Activity

EchoInsight STORE associations are initiated by the EchoInsight user when the user asks for an export of an EchoInsight analysis report in PDF or SR formats.

#### 2.3.3.2.1. Proposed Presentation Contexts – DICOM STORE SCU

EchoInsight proposes the Presentation Contexts shown below.

Abstract Syntax Name	Abstract Syntax UID	Transfer Syntax Name	Transfer Syntax UID	Role	Extended Negotiation
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Implicit VR, LE;	1.2.840.1008.1.2	SCU	None
		Explicit VR, LE;	1.2.840.1008.1.2.1		
		Explicit VR, BE	1.2.840.1008.1.2.2		
		Explicit VR, LE, Deflated	1.2.840.10008.1.2.1.99		
Basic Text Structured Report Storage	1.2.840.10008.5.1.4.1.1.88.11	Implicit VR, LE;	1.2.840.1008.1.2	SCU	None
		Explicit VR, LE;	1.2.840.1008.1.2.1		
		Explicit VR, BE	1.2.840.1008.1.2.2		
		Explicit VR, LE, Deflated	1.2.840.10008.1.2.1.99		

#### 2.3.3.2.2. SOP Specific Conformance Storage SOP Classes

Encapsulated PDR: EchoInsight provides standard conformance for a STORE SCU for encapsulated PDF objects.

Structured Reports: EchoInsight provides standard conformance for a STORE SCU for basic Structured Reports.



## 2.4. Communication Profiles

### 2.4.1. Supported Communications Stacks

EchoInsight provides DICOM TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

### 2.4.2. OSI Stack

Not supported.

### 2.4.3. TCP/IP Stack

EchoInsight utilizes the TCP/IP stack implemented by the Microsoft Windows operating system.

#### 2.4.3.1. Physical Media Support

EchoInsight has no dependency on the nature of the physical layer support implemented by the computer on which the TCP/IP stack provided by the operating system operates.

### 2.4.4. Point-to-Point Stack

Not supported.

## 2.5. Extensions/Specializations/Privatizations

EchoInsight does not support any extensions, specializations or privatizations of SOP Classes and Transfer Syntaxes.

## 2.6. Configuration

Configuration information for EchoInsight is stored in local XML files. Configuration is modified by editing these files with a text editor.

### 2.6.1. AE Title/Presentation Address Mapping

The default AE Title for an EchoInsight system is “EpsilonPC”. The default listener (STORE SCP) TCP/IP port number is 104. EchoInsight AE Titles for queries (both manual and auto) and retrieves are set the same by default, but are configurable and may be set to different strings.

EchoInsight requires configuration information for each DICOM node that acts as a Query SCP for EchoInsight. This information includes: AE Title, IP address or Hostname, and Listener port number.

### 2.6.2. Configurable Parameters

The AE Title for each computer running EchoInsight is configurable via editing local XML configuration files and is limited to 16 printable ASCII characters. The port number is similarly configurable.

## 2.7. Support of Extended Character Sets

EchoInsight does not support any extended character sets.

# 3. Media Storage Conformance Statement

## 3.1. Introduction

This section describes EchoInsight’s compliance to DICOM Media Interchange standards. Details of the DICOM Media Storage Application Profiles and supported roles are provided.

## 3.2. Implementation Model

EchoInsight functions as only an FSR for copying images from media.

### 3.2.1. Application Data Flow Diagram

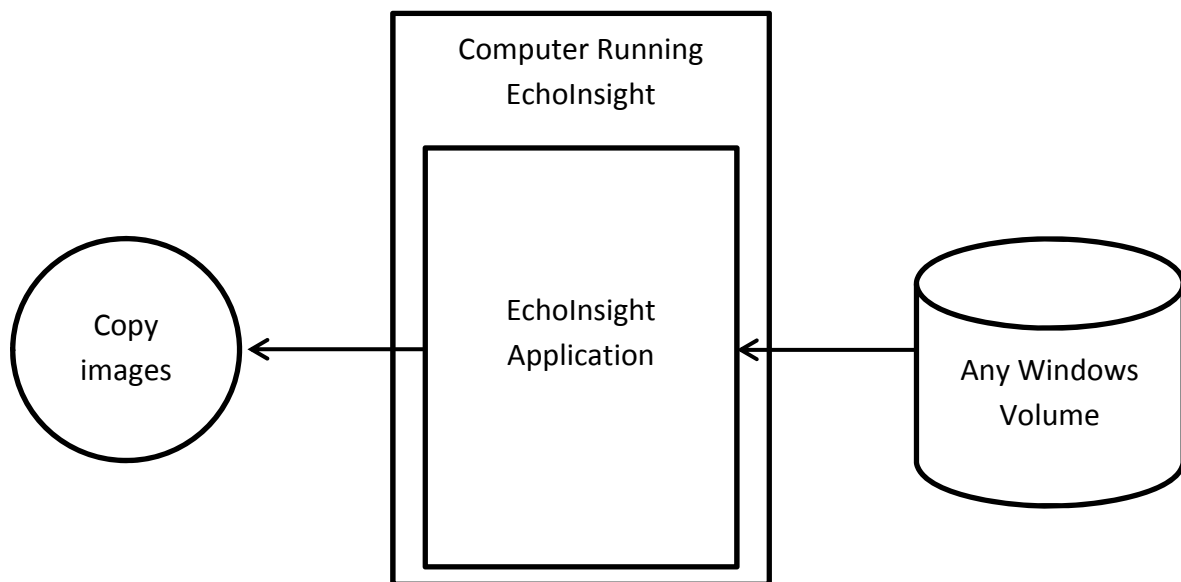


Figure 3.2-1. EchoInsight Media Storage Implementation Model

#### 3.2.1.1. Description of Data Flow for Any Windows Volume

EchoInsight provides an ability to import DICOM File Sets from a variety of physical media formats (anything that the Windows platform running EchoInsight is configured to support).

### 3.2.2. Functional Definition of Application Entity

EchoInsight provides only one function related to Media Storage:

- Copy images from a DICOM File Set (FSR).

### 3.2.3. Sequencing of Real World Activities

EchoInsight supports the following real world workflow:

- Import data function is invoked by the user.
- User browses to the path containing the DICOM File Set.
- User starts import.
- EchoInsight scans file set and attempts to import all available ultrasound data in file set.

## 3.3. Application Entity Specifications

### 3.3.1. EchoInsight Application Entity

EchoInsight provides standard conformance to the Media Storage Service Class for conformance as an FSR. These media APs require the appropriate hardware device to be available on the computer platform running EchoInsight. Additionally, EchoInsight can import data from any USB attached storage device.

Supported APs	Real World Activity	Role	SC Option
STD-US-SC-MF-CDR STD-US-ID-MF-CDR STD-US-SC-MF-DVD STD-US-ID-MF-DVD	Copy Series	FSR	Interchange

EchoInsight provides support for the same SOP classes for Media Exchange as those defined for the Network Conformance as previously presented in section 2.3.2.3.1.2 with the addition of the DICOM Media Storage Directory – as shown below.. Transfer syntaxes supported for these SOPs are also the same as previously presented for Network Conformance. The table of transfer syntaxes appears in 2.3.2.3.1.2 and is not repeated here.

SOP Class UID	Information Object Definition
1.2.840.10008.1.3.10	DICOM Media Storage Directory
1.2.840.10008.5.1.4.1.1.3.1	Ultrasound Multi-Frame Image Storage
1.2.840.10008.5.1.4.1.1.3	US Multiframe Image (Ret) Storage
1.2.840.10008.5.1.4.1.1.6.1	US Image Storage
1.2.840.10008.5.1.4.1.1.6	Image (Ret) Storage
1.2.840.10008.5.1.4.1.1.6.2	US Enhanced Volume Storage

### **3.3.1.1. Real World Activities for EchoInsight Application Entity**

EchoInsight acts only as a File Set Reader. There is no other activity supported. Specifically, EchoInsight does not write or update File Sets. Since no writing is performed, there is no EchoInsight Application Entity Title for Media Storage.

### **3.4. Augmented and Private Application Profiles**

EchoInsight has no augmented or private Application Profiles.

### **3.5. Extensions/Specializations/Privatizations**

EchoInsight does not support any extensions, specializations or privatizations of SOP Classes and Transfer Syntaxes.

### **3.6. Configuration**

EchoInsight does not support any configurable parameters related to its support of Media Storage.

### **3.7. Support of Extended Character Sets**

EchoInsight does not support any extended character sets.